

Lead & Animal Health





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Contents

- Lead and Animal Health
- Sources of Lead in Mining Areas
- Risk Reduction Strategies
- Guidelines for Grazing Management in Areas of Lead Enriched Soils

This document was prepared through the cooperative efforts of personnel from Teagasc, the Department of Agriculture, Food and Marine and other state agencies. Information and advice is directed mainly at the situation that exists in lead-enriched areas near Silvermines, Co. Tipperary



Is lead poisoning common?

Yes. Lead poisoning is the most commonly reported form of toxicity in farm animals in this country. Horses are the most susceptible, followed by cattle and then sheep. Young animals are more susceptible to the effects of lead poisoning than adult animals.

Where does the lead come from?

The most common sources of lead poisoning on farm are man-made materials. These include lead batteries, linoleum, lead containing paints, crankcase oil. Significant outbreaks of lead poisoning have been associated with contamination of silage by lead batteries accidentally shredded in the harvesting process. In mining areas the main environmental source of lead are:

- Soil;
- Stream sediments;
- Mine-spoil heaps and abandoned mine sites;
- Tailings ponds;



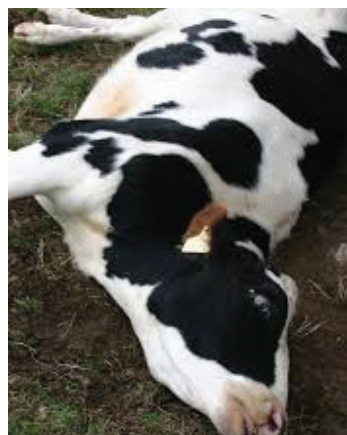


What are the signs of lead poisoning?

Lead poisoning is generally acute in onset and of short duration. Cases generally occur suddenly and usually involve only one or two animals. The most common signs are: staggering, bellowing, muscle tremors, blindness, followed by death in one or two days.

How can a diagnosis of lead poisoning be made?

Diagnosis of lead poisoning can often be made on the basis of clinical signs together with evidence of exposure to a known source. Laboratory analysis of blood samples (collected in special containers) can provide evidence in support of a diagnosis. In the dead animal, lead poisoning can only be confirmed by analysis of tissue samples (kidney or liver). Where lead poisoning is suspected, carcasses or tissue specimens, collected by a veterinary practitioner, should be submitted for laboratory examination as soon as possible after death.



Calves may show “head pressing” behaviour and acute lead poisoning can lead to death within days

Can it be treated?

A treatment for lead poisoning is not currently available. Where cases occur all animals should be removed from the suspected source.





Sources of Lead in Mining Areas

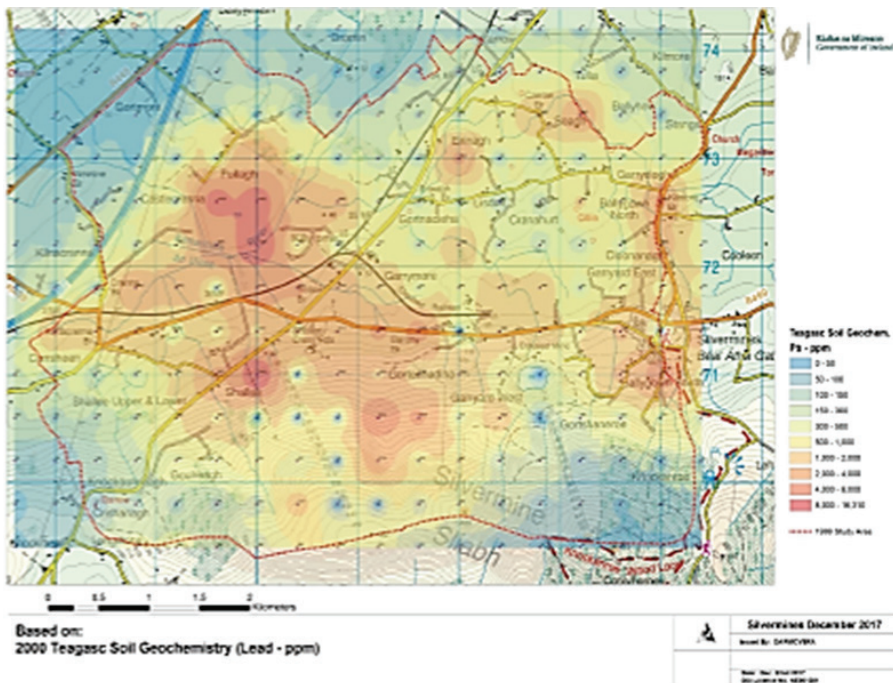
How can I avoid lead poisoning on my farm?

Animals (including companion animals/pets) should be prevented from gaining access to:

- (a) All man-made sources of lead, and
- (b) In so far as is possible, soils and stream sediments with elevated lead levels and sites associated with historic mining activity

How can I find out the lead status of my farm?

If farming within the Silvermines area of Co. Tipperary, consult Map 1 in the Inter-agency Group Report for general guidance on potential lead levels on your farm. On farm field-by-field soil sample analysis may be required to obtain specific information of the amount of lead in the soils on your farm.



Map 1. Levels of lead in the Silvermines area.
Report of Inter-Agency Group on the Silvermines area of
Co Tipperary. May 2018.





How do farm animals ingest environmental lead?

Soil is the main source of environmental lead for animals. This soil may be a contaminant on grass or silage. It may be taken up with roots. Some animals will consume much more soil than others. Soil consumption is highest in water-logged soils, in wet weather, at higher stocking rates, on poached soil and on soil damaged by machinery. Management systems should be designed to minimise the intake of soil by animals.

How much lead can grass contain?

Only a minute amount of lead is taken up by grass. However, significant amounts may be deposited on the surface of grass by splashing or as dust from soil that is enriched in lead.

How is stream sediment dangerous?

The amount of lead that dissolves in water is not considered toxic to animals. However, animal access to streams for drinking water may pose a significant risk because of lead in the stream sediment. Silt in slow-moving streams, or sediment lying at the bottom of “clear mountain streams”, have been found to contain extremely high concentrations of lead. When sediment is disturbed and becomes suspended in water, and animals drink this water, they can take in large quantities of lead. Sediment may also be deposited on pastures as a consequence of flooding.



Cattle drinking from streams increases the risk of ingestion of sediment with high lead concentrations

How is dust dangerous?

Dust can be deposited on grass in large amounts following dust blow from bare soil or tailings. The risk from dust-blow is reduced when bare areas are revegetated.





What amount of lead is dangerous?

A soil lead level of 1000mg/kg has been adopted as a level at which particular attention needs to be taken to avoid exposure of grazing animals to lead. This was derived from toxicological data some years ago but recent studies suggest that this level may have to be revised downwards.



Are some forms of lead more available than others?

We have found no indication of this in soils or sediments from the Silvermines area. Research shows that lead present in soils and stream sediments is very soluble in strong acids such as are present in animals' digestive fluid. Thus, all sediments and all soils enriched in lead should be viewed with caution.

Do small amounts of lead have an effect over prolonged periods?

Chronic poisoning of the type seen in humans is not a problem in farm animals. Although the accumulation of lead in tissues over time may affect the suitability of some animal products (i.e. liver and kidney) for human consumption, these offals are excluded from the food-chain and there are monitoring programmes in place to ensure that the quality of meat and milk from the Silvermines area is not affected. Dairy farmers should note that the maximum levels of lead permitted in milk is 20 parts per billion (ppb), such that particular care needs to be taken in the management (especially in the grazing, watering and silage feeding) of milking cows to prevent this level being exceeded.





Risk Reduction Strategies

What can be done to reduce risk when farming soils with high levels of lead?

Farmers generally cannot change the lead levels of their soils. Treating the soil, or replacing or covering it with clean soil is too expensive. Lead is more soluble and available when soil pH is low. There is some scientific evidence that lead is stabilised in soil as a complex chemical compound containing phosphate. Thus it is necessary to maintain soil fertility.

1. Addition of phosphate fertiliser to soils with low soil P fertility (Morgan's P Index 1 and 2, or 3 under high management regimes) will improve sward health as well as stabilising soil lead.
2. Liming soils and maintaining them at a final pH of 6.5 will improve sward density and grass yield and reduce the bio-availability of lead. Soil testing should be conducted at 3-4 year intervals to monitor soil pH status. Where soil pH is less than 6.5 up to 5 t/ ha ground limestone should be applied.
3. Ensuring dense and healthy sward development by use of nitrogen at recommended rates.

Where grasslands need to be reseeded consider direct drilling grass seeds to minimise soil disturbance and maintain high soil fertility in the upper soil layers. Where ploughing with reseeded is considered necessary to improve pastures, grazing management should be carefully managed to avoid soil contamination of the grass sward and sediment runoff especially on fields, with a slope or gradient. Animals may ingest more soil, from these fields.

What can be done to improve the quality of the herbage?

Poor nutrition appears to increase risk of toxic effects of lead when animals are continuously exposed. There are good nutritional grounds for fertilisation in order to enrich herbage with phosphate and calcium as these are considered to lower the toxicity of lead to animals. Sulphur, which can be added with nitrogen fertiliser, may do the same. Zinc

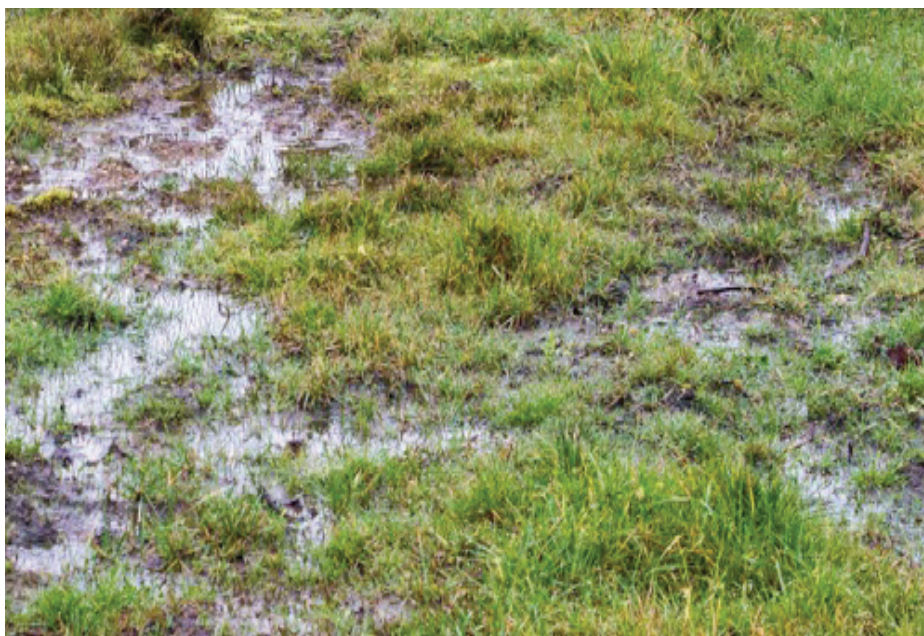




supplementation may also antagonise lead adsorption; however, zinc is usually present at high concentrations in soils with high lead levels.

How should I manage the soil to minimise soil ingestion?

Essentially you should minimise the impact that animals and machinery have on the sward and soil surface. Avoid overstocking, grazing on soft ground and out of season grazing. Pay particular attention to vulnerable areas at gateways and near water troughs. Where the sward is damaged, roll at an opportune time early in the year and allow a sufficient interval for fresh grass growth before grazing.



Poaching increases risk of grazing animals ingesting soils with high lead concentrations

What can be done to avoid the effects of lead-enriched sediment?

Fence off drains and streams to restrict access by stock. When field drains are cleaned, dredgings should be disposed of close to the stream - possibly as a bank. It is important that exposed material be vegetated as soon as possible.





How do I cope with sediment deposition after flooding?

Flooding can distribute sediment over land. In areas that have been subjected to widespread flooding in the past it is likely that lead may be present in soil and sediment at similar concentrations. Flooding will also cause herbage to become coated with sediment. Rain is unlikely to remove this sediment once it has dried onto grass leaves. Therefore grazing animals should be restricted from these areas post flooding (3-4 weeks) until sufficient fresh and uncontaminated grass growth has occurred.



Sediment and soil coated on grass herbage after flooding events can increase lead ingestion if animals are allowed to graze before new grass growth has occurred.

How do I cope with soil/sediment windblow?

This may occur during very dry weather on sites neighbouring active mine sites. As with flooding, allow time for fresh and uncontaminated grass growth to occur. Animals should be taken off affected pastures until sufficient new growth has occurred and the pasture is deemed safe to graze as part of the grazing rotation.

How can I adapt my management to take account of soil lead?

Actions should be taken to minimise exposure of animals to soil and sediment. In addition, where there are areas of the farm with both high and low lead, priority should be given to younger animals and milking cows on the low lead areas, while rotating older animals onto these





areas for periodic respite. When deciding on areas of the farm to be used for grass silage it is important that soil is not ensiled with the grass coming from fields with high soil lead levels. Soil contamination should be minimised by making sure the land surface is level through rolling, ensuring the sward is not cut too low, minimising grass tedding and ensure that the baler or forage harvester pickup is not set too low in order to avoid grass contamination with soil. As grass silage is the main winter feed on most farms, contamination of silage with soil high in lead can lead to prolonged lead exposure in ruminant animals over the winter period, and can lead to animal health issues and elevated lead levels in milk.

Are some animals more affected by lead?

Yes. Young animals, including calves, are particularly vulnerable. Special precautions need to be taken to prevent calves access to affected areas - particularly to streams, drains and to sediment therein. Special precautions also need to be taken with milking cows to ensure that their milk does not exceed the maximum permitted level of lead in milk which is 20ppb.

What is the risk in my area?

At the present time the risk of lead poisoning would appear to be greatest from sediments, less from soil lead and least from wind-blown lead. Therefore, precautions should be most stringent: (a) in areas bordering or enclosing drains and streams coming from the Silvermines mountain, (b) where soil lead is highest, between Shallee and Silvermines and (c) in the Yellow River catchment area. See also lead and stream maps in the Inter-agency Group Report May 2018.

What does the future hold!

The future is a mirror of the past but we can learn from it. Department of Agriculture, Food and the Marine surveillance data has shown that, while animal deaths have occurred due to lead poisoning, they account for only a small proportion of annual animal fatalities. With extra caution, further deaths due to lead poisoning can be largely prevented. Dairy farmers will need to pay particular attention to the grazing of and harvesting of silage for milking cows to ensure that they do not exceed the maximum level of lead in milk of 20ppb.





Guidelines for Grazing Management in Areas of Lead Enriched Soils

Soil and river sediments are the main source of environmental lead for farm animals - whether grazing or on conserved fodder, i.e. silage or hay. The following guidelines are intended to reduce the intake of lead by identifying means by which soil ingestion can be minimised.

Grazing Management

- Avoid poaching of land, i.e. avoid winter grazing or grazing on soft ground.
- Avoid over-grazing, (minimum sward height of 5 to 8 cm).
- Rotate grazing of fields and minimise the time young animals spend in high lead areas.
- Animals should not be allowed to ingest herbage heavily contaminated by soil, whether this material arises as a consequence of poaching, flooding or by wind erosion from tailings pond areas.
- Avoid grazing cattle on land subject to river flooding.
- In affected areas, fence off rivers to prevent cattle having direct access to possible lead-enriched sediment.
- Fence off identified areas of lead enrichment, e.g. mine spoil, river dredgings.

Pasture Management

- Avoid disturbance of tailings pond/mine spoil areas.
- Soil should be analysed to establish nutrient status and lime requirement.
Lime soil to pH 6.5 if necessary. Use adequate phosphate, following Teagasc guidelines. Apply adequate nitrogen to maintain dense/healthy swards.
- Roll grass in spring before tum-out.
- Establish a permanent pasture with closed and dense swards.
- Avoid cutting grass or ripping soil with low blade or tine settings on mowers, tedders/rakes and silage harvesters.
- Use direct cutting of silage (i.e. no wilting as this practice can increase the risk of grass contamination).





- If ground becomes compacted, break compacted layer after silage cutting and roll. Avoid ploughing where possible.
- Where re-seeding is required, direct drilling of grass seeds should be used.
If ploughing is necessary care should be taken to ensure a firm seedbed. Late flowering - preferably diploid ryegrass varieties - should be used to ensure a dense sward.
- Dredged sediments should be placed within fenced areas adjacent to drains and never on pastures.





Notes





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